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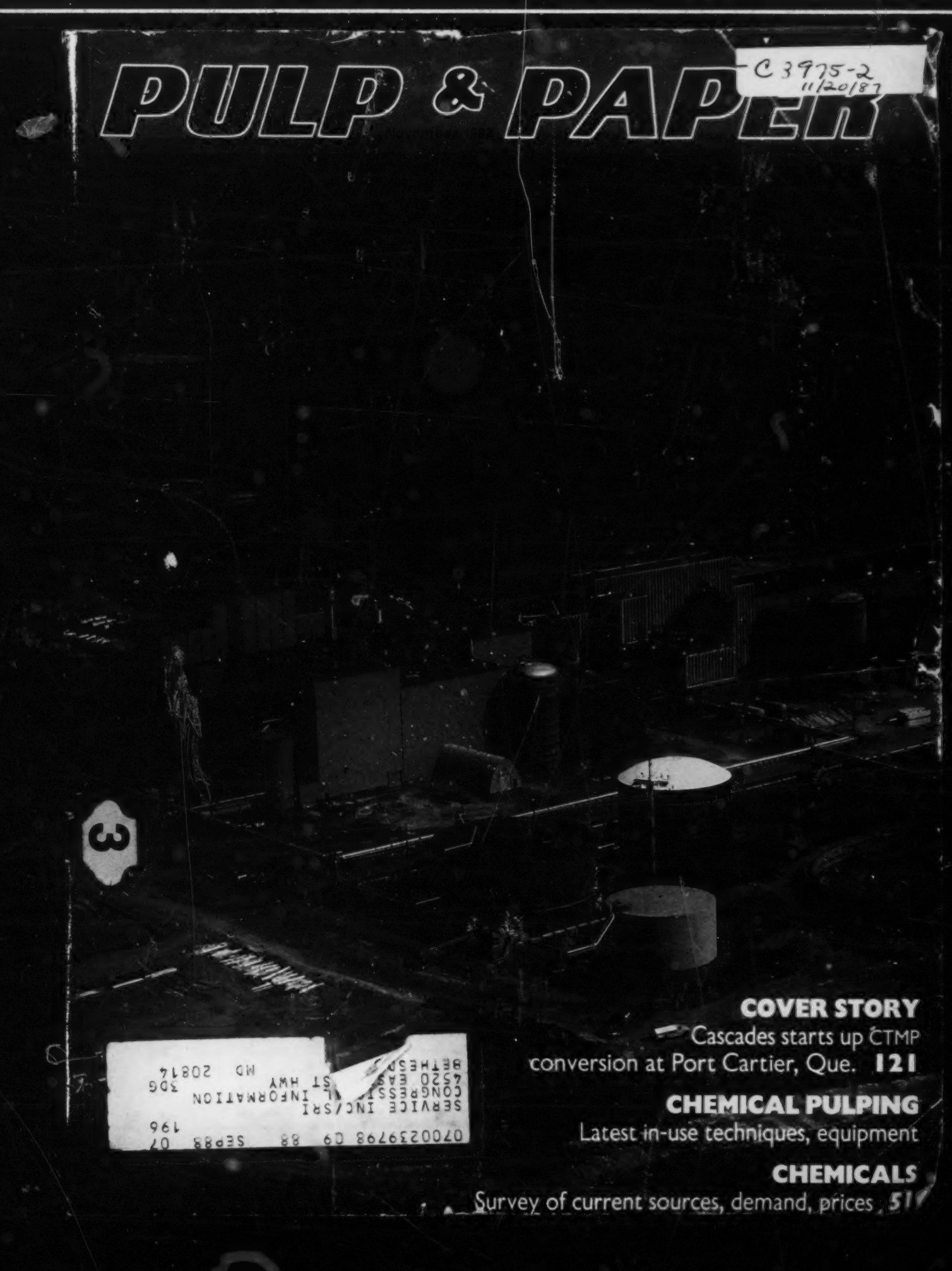

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NOVEMBER

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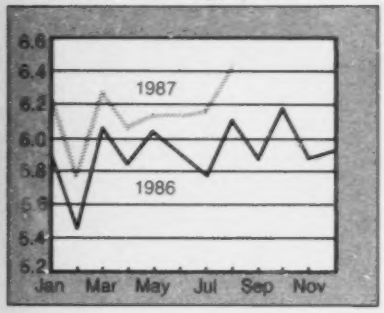
U.S. paper and board production



U.S. production of paper and paperboard totaled 6.4 million tons in August, an increase of 5.4% over the same month last year, according to American Paper Institute data. After following a flat trend for the first seven months of the year, the production rate jumped sharply in August to a record 75.0 million tpy, API reported, up 4.3% from the record pace of a year earlier. Preliminary data for September show production holding close to the August high.

Among major grades, printing and writing paper production climbed 5.6% in August compared with a year earlier, thanks to continued strong demand for coated papers and uncoated free-sheet. Containerboard was strongest among the paperboard grades, as kraft linerboard output climbed 7.1% for the month and fiber box shipments continued at record levels, up 4.6% compared with August 1986.

Canadian newsprint shipments dropped to 785,000 metric tons in August, down 0.6% from the same month in 1986. Shipments for the year to date are still up 5.2% from last year, however. Woodpulp exports posted a 2.7% increase in August, raising the year-to-date total 2.3% ahead of last year. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	August	498	2.5	5,788	2.8
Uncoated groundwood (s)	August	125	-1.6	1,516	0.1
Coated paper (s)	August	591	6.5	6,730	10.6
Uncoated free sheet (s)	August	944	7.6	10,825	4.7
Other printing/writing	August	116	-1.7	1,364	-1.1
Total packaging and other paper (s)	August	412	-3.5	5,034	-1.7
Tissue	August	453	5.3	5,250	3.5
Total paper	**August**	**3,139**	**3.9**	**36,505**	**3.8**
Unbleached kraft paperboard	August	1,685	7.1	18,833	6.8
Semichemical medium	August	481	0.0	5,631	5.0
Bleached paperboard	August	377	10.2	4,428	3.3
Recycled paperboard	August	752	9.0	8,531	5.5
Total paperboard	**August**	**3,295**	**6.7**	**37,422**	**5.8**
Total U.S. paper and paperboard output	**August**	**6,434**	**5.4**	**73,038**	**4.0**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	July	5,111	8.5	59,215	4.5
Market pulp production	July	729	14.3	8,019	7.9
Wastepaper consumption at paper/board mills	July	1,453	10.1	17,417	4.9
Pulpwood consumption (cords)	July	8,195	4.9	93,967	3.0
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	August	24.977	5.3	197.380[6]	5.2
Containerboard inventories at U.S. box plants and mills	Aug. 1	2,497	4.5		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	July	1,004	-9.4	12,362	7.6
Imports of Canadian newsprint	July	707	-11.7	8,683[6]	4.1
U.S. paper exports (including products)	July	436	2.3	5,148	9.4
Exports of unbleached kraft linerboard	July	186	2.2	2,250	11.7
Exports of woodpulp	July	463	54.8	4,857	12.5
Norscan pulp inventories[4]	Aug. 31	1,049	-0.3		
Norscan pulp operating rates[4]	August	100%	105%	100%	98%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	August	785	-0.6	6,405[6]	5.2
Operating rates	August	98%	93%	97%	93%
Inventories held by U.S. consumers	Aug. 31	1,475	2.6		
Other paper/board shipments	August	539	5.7	4,221	6.2
Woodpulp shipments (export only)	August	683	2.7	5,313	2.3
Operating rates	August	98%	93%	97%	92%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft paper: Demand still declining, but strong liner demand and shutdowns keep market tight

Grade structure: Unbleached kraft paper (UKP) is normally divided into four end uses: bag and sack, shipping sack, wrapping, and other converting. Bag and sack paper is the largest category, accounting for about 62% of total shipments, followed by multiwall shipping sacks, 23%; other converting, 12%; and wrapping, 3%. Basis weights for bag and sack paper range from 30 lb to 80 lb/3,000 ft^2, with the lower basis weights being used for small grocery and merchandise bags while 70 lb is most commonly used for grocery carryout sacks. Multiwall shipping sack paper is 50 lb or 60 lb. Extensible or air-dried paper may be used for shipping sacks requiring extra strength.

Production/capacity: UKP shipments declined 3% to 3.3 million tons in 1986, reflecting some improvement over the 7% decline in 1985. As in previous years, the "rationalization" of UKP capacity matched the decline in shipments, resulting in an operating rate of nearly 95%. Among the industry's capacity reductions, the largest shutdown was Champion International Corp.'s 236,000-tpy No. 5 swing machine at Pensacola, Fla., at the end of the third quarter for conversion to uncoated free-sheet. Georgia-Pacific Corp. converted No. 2 machine at Crossett, Ark., to uncoated free-sheet and Gilman Paper Co. converted UKP capacity at the St. Mary's, Ga., mill to uncoated free-sheet.

While the industry continued to reduce total capacity in 1987, some companies actually bucked this trend and increased capacity. The most notable event was the reactivation of the former Jacksonville Kraft mill by Stone Container Corp. in the first quarter. Jacksonville's 125,000-tpy No. 1 machine is producing 40- to 60-lb sack and multiwall grades.

For 1987, UKP shipments are expected to decline about 7% to 3.1 million tons due to weak demand in bag and sack grades. Consumption of unbleached kraft paper is expected to show a somewhat smaller decline in 1987 because of higher imports from Canada. The industry's operating rate for all of 1987 could be 94%.

Market segments. Grocery bag and sack paper shipments declined 4% to 1.9 million tons in 1986, and this year they will show about an 8% decline. Paper grocery carryout sacks continue to face stiff competition from plastic bags. Plastics' share of the grocery sack market has steadily increased during the past decade to reach about 25% in 1987.

Multiwall shipping sack paper volume dropped 6% to 747,000 tons in 1986, but shipments this year are expected to increase about 7%. Industry sources cite improvements in the farm economy, as well as strength in industrial and chemical markets, for the turnaround. Another factor is a favorable price relationship to heavyweight grocery sack paper, which is encouraging converters to use more multiwall paper. Wrapping and other converting uses for unbleached kraft papers increased 5% to 595,000 tons in 1986 and should show slight gains again this year.

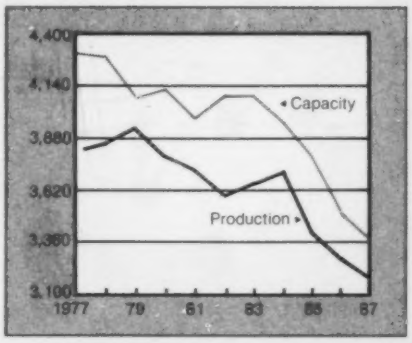
Pricing: UKP prices have escalated steadily during the past two years following heavy discounting pressure in 1985. The strong demand for linerboard from swing machines and the capacity reductions in unbleached kraft papers have allowed producers to announce price increases on a regular basis. This year, about 900,000 tpy of kraft paper is being produced on swing machines.

Heavyweight (70 lb) grocery sack paper prices have increased from a low of $260/ton in 1985 to about $425/ton in the last quarter of 1987. Similarly, multiwall (50 lb) kraft paper prices have increased from $360/ton to $490/ton during the same period. Prices of lighter-weight kraft paper grades (30 lb) have been less active because lighter-weights are less directly affected by strong demand for linerboard.

Year-end price history for 70-lb grocery sack paper is as follows: 1980, $280; 1981, $300; 1982, $240; 1983, $280; 1984, $330; 1985, $300; 1986, $365; 1987(3Q), $400.

Multiwall sack paper (50 lb): 1980, $375; 1981, $405; 1982, $360; 1983, $380/$410; 1984, $390; 1985, $360; 1986, $420; 1987(3Q), $450. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1986	1987e	1988e
Shipments	3,303	3,200	3,150
Capacity[1]	3,495	3,415	3,420
Utilization rate	94.5%	93.7%	92.0%
Imports	115	125	110
Exports	78	75	80
Apparent U.S. consumption	3,340	3,250	3,200
lb/capita	27.6	26.7	26.2
GNP ratio	0.90	0.89	0.89

e = estimate.
1. Capacity for 1986 adjusted for removal of 125,000-tpy Jacksonville Kraft machine.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container[1]	773	22.6
2. Union Camp	450	13.2
3. Georgia-Pacific[2]	340	10.0
4. Longview Fibre	325	9.5
5. International Paper	260	7.6
6. Champion Intl.[3]	195	5.7
7. Gilman Paper	165	4.8
8. Mid-America[4]	137	4.0
9. Gaylord Container[5]	121	3.5
10. Chesapeake	115	3.4

Market share of top five companies:
62.9%

Market share of top ten companies:
84.3%

Total U.S. capacity (1987):
3.415 million short tons

1. Reflects startup of former Jacksonville Kraft No. 1 machine.
2. Reflects shift of capacity to Palatka, Fla., and Toledo, Ohio, mills.
3. Reflects shutdown of Pensacola, Fla., No. 5 machine.
4. Acquired Weyerhaeuser's Pine Bluff, Ark., mill in 1986.
5. Acquired Crown Zellerbach's Bogalusa, La., mill in 1986.

NEWSPRINT

Producers try to raise prices

Most of the major newsprint companies throughout the U.S. and Canada have announced price increases to take effect with shipments on Jan. 1, making the movement that started with CIP Inc. and Bowater Inc. virtually unanimous.

In Canada, Abitibi-Price Inc. raised its price for Canadian customers effective Jan. 1 to C$750 from C$685, the same as an earlier announcement by Consolidated-Bathurst Ltd. Newsprint producers in British Columbia also announced price increases for Canadian customers. Effective Jan. 1, prices in Canada will be raised to C$685/metric ton from C$620. Joining the attempt were British Columbia Forest Products Ltd., Crown Forest Industries Ltd., and MacMillan Bloedel Ltd. Prices to British Columbian customers were last raised on Jan. 1 from C$585. Eastern Canadian prices had last gone up Apr. 1 from C$635.

In the western U.S., MacMillan Bloedel Ltd. started the attempt to hike prices, announcing that it would lift list prices $30 to $630/metric ton and eliminate a 3% "temporary competitive allowance" but keep a 5% discount for customers who purchase the full annual contract amount. Later announcements followed this pricing pattern. Producers in eastern U.S. markets have announced list levels are slated to rise on Jan. 1 to $650 from $610.

Champion International Corp. and Kimberly-Clark Corp. are not expected to raise prices until later in the second quarter as the two lagged behind the rest of the industry when most producers last raised prices on July 1. K-C's prices were last hiked on Aug. 1, while Champion's customers did not pay higher prices until Sept. 1. A number of market observers expect that the two producers will delay their price increases until Feb. 1 and Mar. 1, respectively, in order to keep a six-month lag time in between their price increases. ■

CIP to go ahead with newsprint mill at Gold River

CIP Inc. announced it would proceed with construction of a C$320-million greenfield newsprint mill at the site of its Gold River pulp mill on Vancouver Island in British Columbia. The company expects the mill to be online by the fall of 1989.

The new 230,000-metric-tpy paper machine will raise CIP's newsprint capacity to over 1.5 million tons, ranking it near top world producer Abitibi-Price Inc.'s approximately 1.8 million tons of newsprint capacity.

The paper machine itself will be a Beloit Bel Baie III twin-wire unit. A new chemi-thermomechanical pulp mill will be built to supply the furnish. In addition, CIP plans to expand the warehousing capacity at its nearby deep-water port facility, which can accommodate two ocean vessels at one time.

CIP's J.H. Whalen, executive vice president of marketing, noted that the site of the new mill gives the company the advantage of being able to serve customers from coast to coast in North America, as well as offshore. He also indicated that the new mill had received "encouraging support from the marketplace."

CIP's new newsprint mill will be one of three greenfield mills coming online on the West Coast alone by 1990. The other two are planned by Great Lakes Forest Products Ltd. (180,000 tpy) and Finlay Forest Industries Ltd. (216,000 tpy). In addition, MacMillan Bloedel Ltd. plans to restart a 65,000-tpy newsprint machine at Powell River, B.C., and Crown Forest Industries Ltd. is rebuilding two paper machines for a net increase in capacity of 50,000 tpy.

In other parts of North America, the rise in newsprint capacity will not be as significant, with only one new newsprint machine that is definitely planned in the East by Newsprint South Inc. (205,000 tpy). However, Southeast Newsprint Manufacturing Co. reportedly is close to making a decision on a 190,000-tpy greenfield newsprint mill.

The total of all of these projects would boost the total North American newsprint capacity by less than 7% by the year 1990. However, projects that are in the West will add up to a 20% jump in West Coast capacity to approximately 4.4 million tons from 3.7 million tons currently. This figure could increase even more with other producers, such as Smurfit Newsprint Corp. (*P&P*, October, p. 25), studying possible additions. West Coast U.S. consumption by newspapers is less than 500,000 tpy. Most of the remaining newsprint output is exported to such areas as Southeast Asia. ■

Publishers interested in building news mill in Alberta

Alberta forestry officials expect to receive a proposal shortly from a Vancouver, B.C., investor and a group of publishers interested in constructing the province's first newsprint mill. The consortium, headed by lawyer Ronald Stern and thought to include Southam Inc., is reportedly looking at a 220,000-metric-tpy facility that will cost C$360 million to build.

"The mill makes sense in terms of economies," said Stern, who is also one of the founders of Pacific West Equities Ltd., Vancouver publishers of local magazines. Southam publishes 15 daily newspapers and a financial weekly newspaper in Canada, and owns three large newspapers and one small one in Alberta. According to one estimate, Southam's newspapers consume 60% of the newsprint used in Alberta.

Stern refused to divulge the identities of his other partners. The consortium reportedly is linked to eight or nine major newsprint buyers, some of which are publishers and the rest are other types of end users. ■

TABLE 1: **Newsprint—US$/metric ton delivered to eastern U.S.**

	First quarter	Second quarter	Third quarter	Fourth quarter
1984	500.00	500.00	535.00	535.00
1985	535.00	535.00	535.00	517.50
1986	517.50	507.50	517.50	525.00
1987	540.00	540.00	566.67	570.00

1987 HAS TURNED OUT TO BE ANOTHER BANNER YEAR FOR CHEMICAL SUPPLIERS

P&P's survey reports a lot of activity in pricing, expansion; many chemicals tight or in short supply due to strong pulp, paper production

By MICHAEL J. DUCEY, Technical Editor

The pulp and paper industry continues its upward climb: production figures released by the American Paper Institute (API) indicate sustained or steady growth during the first half of 1987 vs 1986 for pulp (3.7% vs 3.8%), paper (3.5% vs 2.8%) and paperboard (5.2% vs 4.9%). In Canada, the Canadian Pulp & Paper Assn. (CPPA) reports production increases for woodpulp at 7.5% over the first half of 1986, and paper and paperboard production up about 6.4%. This year is also shaping up to be one of the most profitable in history, as nearly all paper products have introduced price increases with great success. Not surprisingly, chemical suppliers have enjoyed a strong year of increased sales, and many sectors are scrambling to expand, in expectation of a continued strong market.

Among the star performers which have helped with chemical consumption are coated papers and paper-grade market pulp. API reports growth for coated paper at nearly 10%. Correspondingly, our survey found suppliers of kaolin, latex, and other polymers received a large boost in deliveries. Uncoated free-sheet production rose 3.4%, with a few alkaline papermaking conversions, and shipments of calcium carbonate, alum, and filling clays all fared well.

Market pulp production, softwoods in particular, gained in the U.S. (5.8%) and in Canada (9.1%), and operating rates (along with prices) seemed to be at a maximum. This contributed to increased consumption of sodium chlorate, chlorine, and caustic. Mechanical pulps jumped 6.1% in Canada and 2.7% in the U.S., and hydrogen peroxide and other aids had a full year of growth.

In the specialty areas, suppliers also found high interest. For pulping, oxygen extraction has been fully accepted, and prebleaching retrofits are currently on the rise (strong interest in the Pacific Northwest is reported). Sodium sulfite solutions for mechanical pulps are very popular, and many maufacturers have either tried to use it or are using it currently. Sulfur got a kick from emulsified products, which are used in the makeup of cooking liquor. Anthraquinone and other pulping specialties have only been applied in spots.

In papermaking, quality is being sought universally by end users, and chemicals are satisfying many needs. Modified starches are being consumed at higher rates. The mills concerned with runability are applying more biocides and defoamers in customized shipments. An indication of the strength of the industry and the economy itself is reflected in the use of colored paper, produced through addition of dyestuffs, which had a record year.

The pulp, paper and paperboard industry is a multi-billion-dollar market for the chemicals industry. By estimations from Frost & Sullivan, coatings and fillers represent close to 1 trillion pounds, bleaching agents are at 8.2 billion pounds, pulping additives are at 4.8 billion pounds, sizing components are at 4.3 billion pounds, forming aids are at 357 million pounds, and several others total close to another 100 million pounds. All told, inputs of hundreds of inorganic and organic materials run about 14 million tons. Roughly 65% require processing at the mill, although this is rapidly changing. The mills are seeking to streamline production, and the suppliers are gladly supplying products for the site-ready shipment.

In this year's survey, the larger commodities are listed by the sources, with comprehensive comments from suppliers and mills. Movement of suppliers and trends in usage are the focus of each listing. *Pulp & Paper* invites all interested parties to comment on the information provided for use in the 1988 chemical columns and the year-end survey.

TABLE 1: **Sulfur and sodium sulfite post best results among other pulping chemicals.**

Chemical	Consumption 1986 tons (000)	Consumption 1987 tons (000)	% change 1987-1988
Lime	1,190.0	1,290.0	+2.5
Soda ash	200.0	207.0	+2.5
Salt cake	510.0	515.0	+0.5
Sulfur	110.0	139.0	+4.0
Sulfuric acid	830.0	880.0	+2.5
Sulfur dioxide	50.0	56.0	+1.5
Sodium hydrosulfide	5.5	5.9	+1.0

PULPING CHEMICALS

CHLORALKALI

Sources: Nationally, 75% of chlorine production is accomplished by diaphragm cells, 17% by mercury cells, 3% by membrane cells and 5% by other technologies. There are 24 chloralkali producers at 50 locations with a total nameplate capacity of 35,144 tpd of chlorine and 36,425 tpd of dilute caustic. Chemical processing industries account for most of the chloralkali consumption (44% of chlorine, 34% of caustic), followed by pulp and paper (16% of chlorine, 24% of caustic), polyvinyl chloride, water treatment, and others.

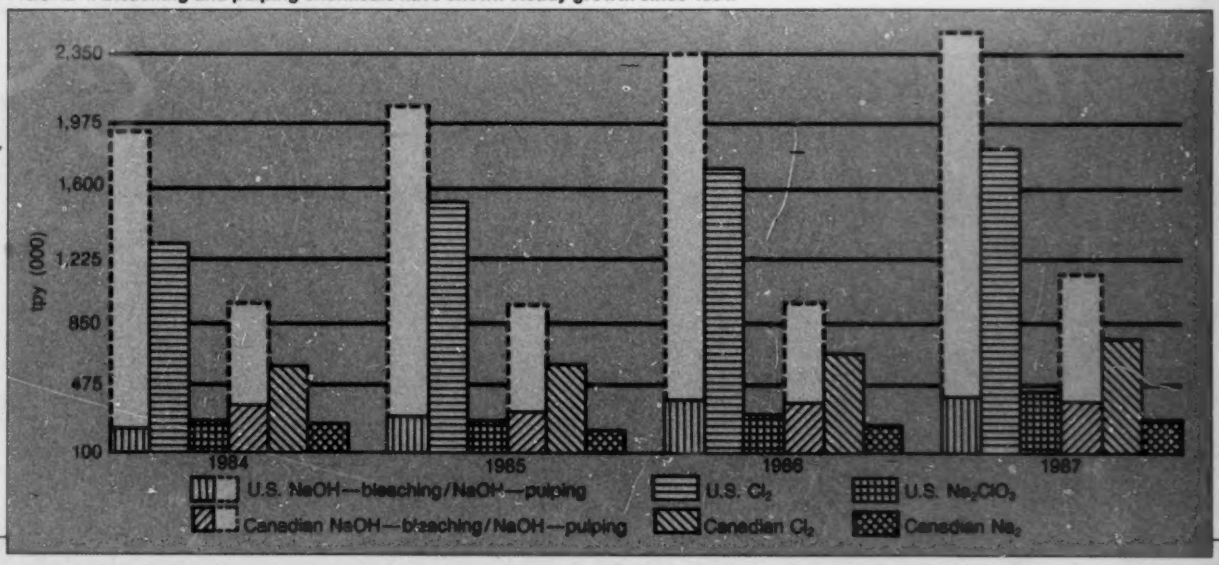
Supplier forecast: Dow Chemical Co., the largest producer, has implemented a multimillion-dollar program aimed at increasing capacity while decreasing production costs and improving product purity. Its latest move concerns the debottlenecking of the plant at Freeport, Texas, where 550 tpd of chlorine should be available late in 1988. Dow also will open a small membrane cell demonstration plant (30 metric tpd) later this year, in hopes of learning more about this emerging technology. The Japanese and others here and worldwide have had tremendous success with this technique. In other supplier news, OxyChem has acquired DuPont's plant at Corpus Christi, Texas (1,260 tpd of chlorine, 1,420 tpd of caustic), and reports high operating rates for its new membrane cells at Taft, La. Niachlor, a joint venture of DuPont Corp. and Olin Corp., is nearing completion of the chloralkali unit at Niagara Falls, N.Y. (660 tpd of chlorine, 730 tpd of caustic). Startup is scheduled for December. Elsewhere, energy costs are reportedly rising in the Gulf Coast area, which may help to continue the strong price rises of the last two years. The latest price increases for caustic reflect regional market situations ($300/ton in the West, $200/ton in the East), as prices moved up $25/ton. Tight supply is forcing consumers, both with contract and without, to give proper notices (30 to 90 days) for modifications to orders. Most suppliers say prices will change on a quarterly basis into the foreseeable future. One technology note from the Univ. of Southern California finds production of chlorine possibly becoming cheaper. Instead of using the electrolysis of brine to produce coproducts, the process separates hydrogen chloride through burning with a catalyst and separating through chemical and physical means.

Mill demand forecast: Although new technologies have tried to uproot chloralkali products from pulp mills, pulp producers still feel that they are the most cost effective. Recently, the Environmental Protection Agency (EPA) reaffirmed federal guidelines on limitation of BOD_5 and color discharges by keeping mid-1970's legislation intact. This is sure to hold down oxygen delignification installations to a slow level, guaranteeing chlorine and caustic a home in the near future in chemical pulp bleacheries. In Canada, the situation is quite different, and turnover of systems appears imminent. Caustic may receive another boost as mills experience good results with modified cooking techniques.

SODIUM CHLORATE

Sources: Total North American capacity is approximately 844,000 tpy, with six commercial sites in the U.S. and 13 commericial sites in Canada. Output in Canada was

FIGURE 1: **Bleaching and pulping chemicals have shown steady growth since 1984.**



up over 18% for the first half of 1987 (influenced by strong exports to the U.S.), while U.S. plants are running at 95% operating rates. Both solution and crystal products are manufactured, the latter gaining in popularity because of the economics involved in shipment (particularly from Canada).

Supplier forecast: The prices for solution are currently $355/ton (freight equalized MacIntosh, Ala.), and crystal prices are $350/ton (average delivered cost). These reflect a rather balanced supply/demand situation, as suppliers continue to jockey for position in the current market as well as the future one. Spot customers are paying substantially higher prices, especially on the West Coast. Canada has had the majority of capacity changes over the last two years. The Alby-Olin joint venture started up in September 1986 (55,000 tpy). Canadian Oxy added 7,000 tpy at its Brandon mill earlier this year. QueNord Inc. opened its expanded facility in Magog, Que., in September 1987 in an effort to triple capacity over two years to 101,000 tpy. ERCO plans expansion and modernization projects that will lift capacity in North Vancouver, B.C., to 84,000 tpy; Buckingham, Que., to 70,000 tpy.

Mill demand forecast: There is currently a great deal of interest in expanding chlorine dioxide generating capacity. *Pulp & Paper Project Report* disclosed five sites announcing new equipment in the U.S. for 1987, with many projects planned for 1988 as well. Canada has also moved foward with several projects. For existing bleacheries, there is renewed interest in employing higher substitution rates in the chlorination stage for more efficient bleaching of pulp. In new or overhauled bleach plants (i.e., sequence splitting, etc.), technology of high-substitution ClO_2 seems to be part of the project.

HYDROGEN PEROXIDE

Sources: DuPont, FMC Corp. and Interox America have been joined in the North American market by Degussa Corp. and Atochem, companies from western Europe. Capacity is up to 275,000 metric tpy (100% basis).

Supplier forecast: Growth in capacity has not influenced prices as much as first thought in this boom market for hydrogen peroxide. Prices have remained steady at $0.325/lb (50% basis) for nearly three years, and demand (both real and potential) is keeping that level firm. Two plants began operation this year. DuPont's Maitland, Ont., facility reached full production early in 1987 at 80 million lb/year, making them North America's largest producer. Degussa Corp.'s Mobile, Ala., plant was just beginning operation at press time and is also slated for 80 million lb/year. Another plant in Canada, constructed by OxyChem Canada (jointly owned by French companies L'Air Liquide and Atochem) and expected to produce 44 million lb/year, is scheduled to be online this year. FMC, after pulling out of a project in Squamish, B.C., has decided to invest in a plant in Thailand. Many suppliers paint a rosy picture of the future, in which hydrogen peroxide will be the chosen oxidizer of Third World countries for water treatment and agricultural uses. Countries in the Far East have already adopted the chemical as such. In technology news, Degussa says hydrogen peroxide can be used in wet scrubbers for small-scale removal of SO_2 in stack gases.

Mill demand forecast: The bulk of hydrogen peroxide is used in bleaching mechanical pulps, although it does have a share in both chemical pulp bleaching and deinking. Mechanical pulp producers are turning to hydrogen peroxide as their chief component for whitening pulp, especially the manufacturers of market CTMP grades (which are commanding a good share of tissue and toweling markets and presently have a foothold in printing and writing grades). Systems use between 1% to 2% on o.d. wood in either one- or two-stage processes, combining with sodium hydrosulfite in some cases. Three large mechanical pulp plants are under construction in Canada, and two are being considered in the U.S. There has also been a fair amount of new newsprint and groundwood paper capacity announcements. In Europe, interest in mechanical pulp has spurred the announcements of at least two new hydrogen peroxide projects for next year. In chemical pulp bleaching, there has been moderate growth in hydrogen peroxide as a final polishing step for market pulp (for export, especially) and in use in extraction stages. Newly released evidence claims large efficiency gains in E_O stages with addition of H_2O_2. In German sulfite mills, this technology has helped to eliminate first-stage chlorination, thus reducing effluent loads. One mill in the U.S. has adopted this technique.

OTHER SODIUM CHEMICALS

Sources: Two producers, Olin Corp. and Virginia Chemicals Inc., operate five plants producing sodium hydrosulfite products in the U.S. Morton Thiokol Inc.'s Ventron Div. operates a sodium borohydride facility in Danvers, Mass., and will shortly be joined by Covan Ltd., who plans to manufacture a similar product in Conshohocken, Pa. Sodium hydrosulfite capacity stands at 76,000 tpy, while sodium borohydride capacity, with the new unit (3 million lb/year) should be around 20,000 tpy.

Supplier forecast: Because of the success of mechanical pulp production and the demand for more brightness in groundwood grades, both chemicals enjoyed mild increases in shipments (about 4%) in North America. Because of the increased use of hydrogen peroxide and factors pertaining to cleaner wood for pulping (woodroom

improvements, screening efficiency), the consumption per ton of pulp will probably decline. However, in an attempt to reach new brightness standards for some newsprint products and groundwood specialties, more attention is being focused on existing bleacheries that, for the most part, employ dithionite. Virginia Chemicals released a new product called SUS-PEN which can be delivered in a 33% suspension. Previously, product was shipped in 11% or 13% solutions. Prices of customized products did experience an increase at mid-year.

Mill demand forecast: As mentioned, in newer projects, the choice of mechanical pulp bleachers is primarily hydrogen peroxide, with support from dithionite. Some existing systems use H_2O_2 to polish dithionite bleached pulp. Price competition between the two might result in dithionite being the winner (for example, if energy costs shot up), and the tide might be reversed. There may be some great potential in nonchlorine bleaching of chemical pulps, should that technology ever be commercially explored.

OTHER PULPING CHEMICALS

Sodium sulfite is gaining acceptance in pulp production very quickly. Semichemical mills and thermomechanical mills are both using it, the former as a substitute for soda ash and sulfur and the latter for chemical treatment that increases pulp strength in papermaking. Consumption amounts vary (0.5% to 4% on o.d. wood), but mills are most happy with its site-ready applicability. The main supplier, Koppers Co. Inc., has recently expanded two plants (Petrolia, Pa., and Tuscaloosa, Ala.) to facilitate delivery of all grades.

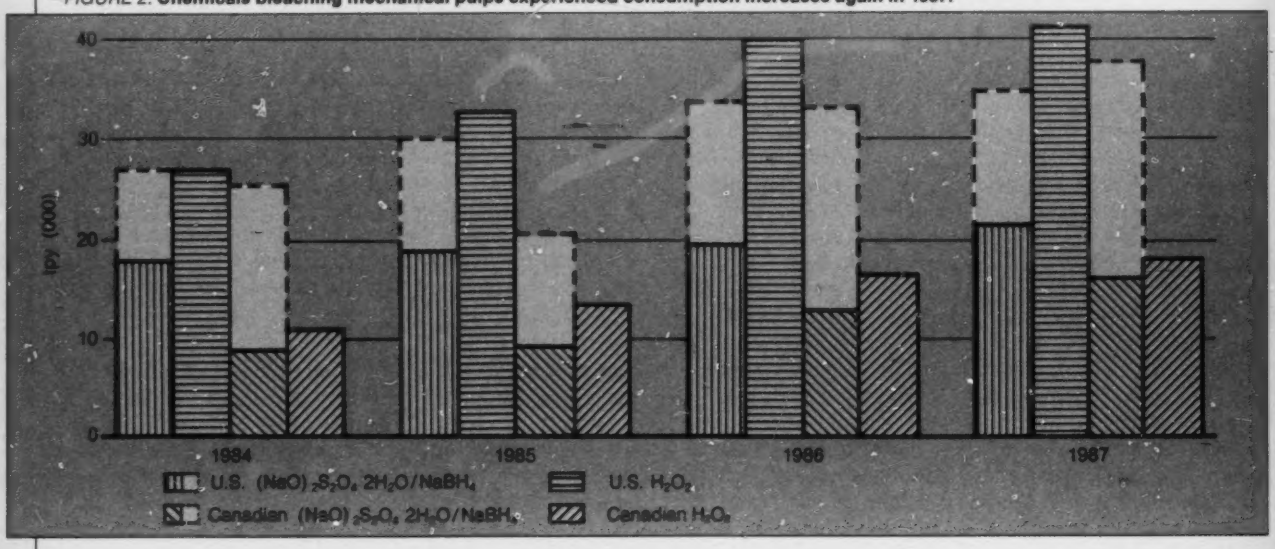
Interest in **oxygen** is still very strong. Startups of oxygen delignification units, which consume ten times as much chemical as oxygen extraction systems, are the chief contributors to oxygen consumption growth. Some mills also use it to enrich treated water at discharge pipes and to boost capacity of lime kilns. In supplier news, Airco Industrial Gases is spending $135 million to build or expand separation units in Nashville, Tenn., Claymont, Del., Vancouver, Wash., and Trail, B.C. (concerning oxygen). Air Products & Chemicals was recently awarded a patent for a new membrane separation technique.

Sulfur, sulfur dioxide and **soda ash** used in sulfite pulping remain in a no-growth situation. Small production gains in Canadian sulfite pulping and use of emulsified sulfur for sulfate liquor makeup have helped offset any decline due to sulfite plant closures (one this year). The market for sulfur and soda ash is improving as far as price is concerned, with supply thinning and some recovery occurring in the bread and butter markets (construction, glass, chemical processing).

Sodium sulfate and **sodium hydrosulfide** are also stagnating. Tighter control of recovery loops (more efficient boilers, use of spent acid from chlorine dioxide generators) and use of products requiring less mill processing (like emulsified sulfur) and are reducing consumption of these once-popular liquor makeup chemicals. **Lime** usage is in a similar situation, with no growth available except in following industry production. But one bright spot for lime is installation of onsite calcium carbonate (see following section on papermaking chemicals).

Sodium silicate is slowly being replaced by customized formulations, whose chief component is **surfactants**. **Defoamers** in washing pulp are doing well, as many brownstock washing systems operate at overcapacity. **Sulfuric acid** was bumped in price during the second quarter due to strong export markets.

FIGURE 2: **Chemicals bleaching mechanical pulps experienced consumption increases again in 1987.**



PAPERMAKING CHEMICALS

ALUMINUM SULFATE

Sources: Several companies sell a variety of grades. Production of aluminum sulfate products stood at 3.2 million tons in 1986.

Supplier forecast: Price and consumption of all grades have been flat for several years, mostly due to downturns in usage by municipal water treatment facilities. One expansion has been announced. General Alum & Chemical Corp. will be building a $1.5-million plant (its third) and R&D center in Saukville, Wis. Completion of the 40,000-tpy (dry) plant is scheduled for late this year, while the R&D center will be finished in 1989.

Mill demand forecast: Traditionally, consumption increases of alum are tied to production of the industry, since nearly all systems use it for pH control while adding paper size. With several fine paper makers converting machines to an alkaline system or bringing on new machines incorporating this technology, the amount of alum consumed is reduced (on average 30%). Mills are also using polymers or lime for wastewater treatment, another area where alum was popular.

CALCIUM CARBONATE

Sources: Production of calcium carbonate reached over 1.5 million tons last year, the majority being natural ground grades. Two firms supply precipitated grades for papermaking applications.

Supplier forecast: After some mergers and acquisitions during the past two years, the dust has settled, resulting in a quite competitive marketplace. The greatest development is the announcement of five new onsite generators. Pfizer Minerals claims four of them. It has recently purchased a 42,000-ft² laboratory and office complex in Bethlehem, Pa., from Gulf & Western Industries. The space will be used to house a technical staff that has tripled over the last three years. The other generator supplier is Steel Bros., a subsidiary of the Canadian conglomerate. Because an oversupply situation persists in the market, an upward price movement has not been predicted in the near future. Discounting exists in a few regions.

Mill demand forecast: Since one or two machines are switching to or starting on alkaline papermaking every year, the use of calcium carbonate will grow (as long as it remains cheaper than fiber). Many mills are trying to use ground grades (fine and ultrafine) for a cost savings, and one source mentioned that several companies are researching onsite generation. Some suggest that coating applications are slowing, as filler applications grow stronger. Mills also comment that conversion to alkaline is not the problem, but running at full production with an alkaline system is the real challenge. Problems such as reduced wire and fabric life, foaming, and overloads in the whitewater system seem to be the biggest hurdles.

CORNSTARCH

Sources: There are 21 corn processing plants in the U.S., and four in Canada. Major new capacity has come onstream during the past two years, mostly for milling corn and drying products.

Supplier forecast: Prices for unmodified products (pearl starch) have never held to their list, and discounting of up to 50% is not uncommon. Overcapacity does not help the situation and neither does new product competition from potato starches (see below) and other surface sizing (polymers) and retention aids. Although enjoying market success with products such as high fructose corn syrup, the market for specialty starches (modified products) has been riding the long, rolling wave of end user demands for high-quality products. In the technology end, two equipment developments are helping to maintain starch use. One is the new starch cooker "in a pipe" by Jylharaisio, which is very popular in Europe for wheat and potato starches. Another piece of equipment pushed by suppliers is the new high-speed surface sizer. This device, now manufactured by four companies, incorporates the short dwelltime concept made popular by the new generation of blade coaters installed during the 1980s. In technology, Degussa Corp. is claiming a major breakthrough in the modification of starch. It has developed a process in which an inorganic catalyst is mixed with a reagent (an epoxide compound) and added to dry starch. The reagent chemical bonds to the starch, giving a cationic charge. The advantages are said to be achievement of a higher yield of cationized starch, lower investment of conversion equipment, and no effluent. Starch is also being investigated for use in the production of a biodegradable film for the fast food industry.

TABLE 2: **Dyes lead the pack in select papermaking and coating chemicals.**

Chemical	Consumption 1986 tons (000)	Consumption 1987 tons (000)	% change 1987-1988
Dyes	11.5	14.0	+8.5
Polyvinyl alcohol	10.1	11.5	+7.0
Polyvinyl acetate	85.0	87.5	+2.0
Surfactants	22.0	26.5	+4.5
Defoamers	59.0	66.0	+3.0
Biocides	8.0	9.5	+10.0

Mill demand forecast: Mills have been more interested in the ethylated and oxidized grades, and the cationic and amphoteric grades for wet end addition. They are easy to use and contribute to the overall paper quality improvements across all grades. Wet end addition is usually below 5-lb/ton rates for printing and writing grades. However, larger amounts are common in board production.

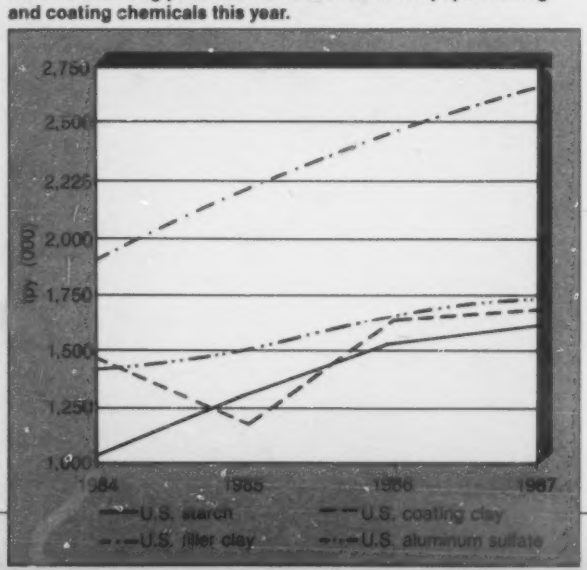
Potato starch: Historically consumed in Europe, these products are now being applied in paper machine wet ends as retention and drainage aids and as a strength enhancer in finished paper. A.E. Staley Manufacturing Co. and Nalco Chemical Co. currently market these products in North America.

KAOLIN

Sources: The vast majority of clay mined and processed in the U.S. comes from the state of Georgia. Seven companies operate in 14 locations, where nearly 11 million tons were produced last year.

Supplier forecast: Product lines of kaolin grades have spread fantastically during the past three years. Calcined clays have also gained with the squeeze in titanium dioxide supply. As has occurred in the industry itself, kaolin grades have experienced a split in their consumption. The value-added grades (upper end) have been accepted for the more expensive paper grades, while lower class grades have been more inclined to use lower grades of kaolin in combination with other products. Prices have moved up nicely over two years, as demand has been strong. Two manufacturers have expanded or modernized their facilities for value-added products and additional capacity. Most recently, Engelhard Corp. announced plans for $40 million of work on its Gordon and McIntyre plants, projects set for completion in 1988.

FIGURE 3: **Strong pace maintained for common papermaking and coating chemicals this year.**



Mill demand forecast: As more kaolin products become available, industry use will increase. Modernizations at manufacturing sites improve product uniformity and quality, which is what the mills are interested in. Both dry and slurried products are being used, depending on distance from the chosen supplier. As fiber becomes more expensive and scarce and as coatings are relied upon for superior printing surfaces, consumption of kaolin is sure to be on the rise. In Europe, Georgia kaolin products are being made more available through installation of shoreline slurry plants. ECC International Ltd. and Thiele Kaolin Co. have already erected and are operating such facilities on the Baltic and English channel.

TITANIUM DIOXIDE

Sources: Production of titanium dioxide did not quite reach 1 million tons last year, but it came very close. Imports are on the rise, as domestic production, hurt by environmental constraints, cannot fulfill domestic demand. Eight locations produce TiO_2, owned by four companies. Canada has two suppliers.

Supplier forecast: Prices have been on an upward climb since even before the industry turnaround due to the rising interest in titanium products in general (for defense products, for example) and through capacity reduction in the U.S. The processing of TiO_2 is changing in the U.S., but conversion is slow and hampered by a strong market for products. Consequently, many companies (foreign and domestic) have chosen to build plants offshore. In the U.S., SCM Corp. has decided to expand its Ashtabula, Ohio, No. 2 plant by 18,000 tpy at a cost of $18 million. DuPont has chosen the offshore route and plans new ventures in Taiwan, Rep. Korea and Brazil. SCM is expanding plants in England and Australia. Kerr-McGee Chemical Corp. is hinting at expanding its Hamilton, Miss., plant by 21,000 tpy, but it remains a partner in projects in Saudi Arabia and Rep. Korea. The Tioxide Group, based in Britain, is expanding its Sorel, Que., plant by 10,000 metric tpy; its French plant by 25,000 metric tpy. NL Chemicals is starting up a plant in Varennes, Que. (40,000 metric tpy), raising its Canadian output to 76,000 metric tpy. A Japanese player, Ishihara, is building a 36,000 metric tpy plant in Singapore.

Mill demand forecast: Papermakers are seeking alternatives and substitutes for TiO_2 for cost and supply reasons. It is the most effective opacifying chemical, but extenders and enhancers are literally saving the industry's use of them. Plastic pigment, latex, and calcined clay are helping TiO_2 in manufacturing. As end users and new

paper products push higher quality, TiO_2 will still be a major chemical input. But chances are it will be imported and more costly.

OTHER PAPERMAKING CHEMICALS

Dyestuffs have had tremendous growth over the past two years. The conversion of handling systems, to facilitate liquid products, has been a major influence on their consumption increases across all grades. Dyestuffs help mills to manufacture the "just-in-time" order, and they decrease production cost through less waste, cleanup, and handling.

Latex has also had a great year. These products have contributed to the improved printing quality of coated grades, with less preparation time and less cost. Recently, price pressure has forced some suppliers to reevaluate list prices (currently $0.80/lb), as discounting is up around 25%. New products are also hammering away at latex, with some success in some paper grades, particularly board. In an offshore development, Dow is building a 30,000-tpy plant in Hanima, Finland, in support of all the innovative coated paper expansion there.

Rosin size is in a similar situation as its additive brother, alum. Some upward price movement was recorded during the third quarter when Akzo raised its prices across the board by almost $0.05/wet lb. Tenneco started up a rosin plant in Charleston, S.C., with a capacity of 30,000 tpy. ■

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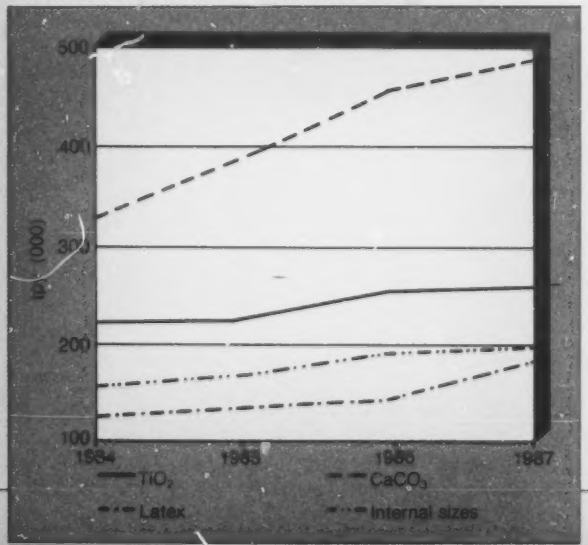
FIGURE 4: **Titanium dioxide hits capacity snag, calcium carbonate and latex show continued success.**



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